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KOKAI PATENT APPLICATION NO. SHO 57-93854

SINGLE PLATE PILING METHOD AND SINGLE PLATE PILING APPARATUS

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SINGLE PLATE PILING METHOD AND SINGLE PLATE PILING APPARATUS

[*Tan'pan sekisai houhoh to tan'pan sekisai sohchi*]

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[There are no amendments to this patent.]

Specification

1. Title of the invention

Single-plate piling method and single-plate piling apparatus

2. Claims of the invention

(1) A single plate piling method consisting of the process in which a single plate is conveyed to a predetermined area at the single plate stand-by position next to the single plate piling zone, and the single plate conveying process in which the single plate is turned over as the lower surface of the aforementioned single plate conveyed is being sucked and conveyed to the aforementioned single plate piling zone.

(2) A single plate piling apparatus having a structure comprising a rotating base provided

next to the single plate piling zone and many vacuum arms having suction holes in the upper surface, one end of which is fitted to the aforementioned rotating base axis at predetermined intervals, and provided with a single plate conveying means consisting of a single plate piling means that makes possible turning-over toward the aforementioned single plate piling zone, and a many roller conveyor arranged with rollers between each of the aforementioned vacuum arms and a stopper that stops the single plate conveyed to the single plate conveying means.

3. Detailed description of the invention

The present invention pertains to a single plate piling method and a single plate piling apparatus used for said method.

In the past, methods described below were used as a process for production of a laminated pile as many single plates are coated with an adhesive and successively piled onto a press and compression is applied.

(1) A method in which single plate 2 is placed on fork 1, the fork 1 is conveyed to the single plate piling zone (see Fig. 1(A)), and retreating of the single plate 2 is prevented by stopper 4 at the time of retrieval of the fork.

(2) A method in which single plate 2 is conveyed to the single plate piling zone by vacuum conveyer 5 provided above the single plate piling zone as shown in Fig. 2, and the aforementioned single plate 2 is conveyed to the single plate piling zone by a separation single plate removal device 6.

However, when the above-mentioned method (1) is used,
as shown in Fig. 1(A) and 1(B), the single plate comes in contact with stopper 4 at the time of piling of the single plate as the fork is being removed, and sufficient piling accuracy cannot be achieved due to warping of the single plate, and furthermore, the single plate loaded on the fork is likely to undergo deformation and forms waves as shown in Fig. 3.

[p. 2]

Furthermore, when the above-mentioned method is used, piling of the single plate coated

with an adhesive onto the press is done with the adhesive-coated surface facing upward on the fork, thus, the adhesive-coated surface of the single plate of the upper-most layer faces upward at the time of production of the laminate, and when the above-mentioned process is divided into several stages, compression is performed as an existing laminate 7 without coating of an adhesive is applied to the upper surface of the upper-most layer as shown in Fig. 4(A) to 4(C), and furthermore, it is necessary to retrieve the laminate 7' produced as described above for compression bonding with the laminated single plate that follows as shown in Fig. 4(C), and when the adhesive is not thoroughly dried at the time of retrieval, delamination of the lower laminates 7' occurs due to dead load as shown in Fig. 4(D), at times.

Furthermore, accurate piling is not possible due to disturbance of the current at the time of falling of the single plate 2 when the above-mentioned method (2) shown in Fig. 2 is used.

As a method used for accurate piling of the above-mentioned single plates, use of the single plate piling apparatus shown in Fig. 5 is being proposed.

In other words, the above-mentioned single plate piling apparatus has a structure comprising belt conveyer 8 that conveys single plate 2 as the single plate is loaded in a lateral orientation, curved surface material 9, which is concave upward in the width direction, and moving arms 10 ... arranged at the leading edge of the above-mentioned curved surface material 9, and having single plate sliding guide plate 11 tilted so that the leading edge faces in the downward direction, and stops 13 for positioning arranged on the upper surface of the table lifter 12 onto which the single plate 2 is piled, and the operation is performed in the order shown in Fig. 6(A) to 6(C).

The operation is explained below.

(1) The single plate 2 is dropped from belt conveyer 8 onto the single plate sliding guide plate 11 as the leading edge of the moving arm 10 of the single plate sliding guide plate 11 approaches the stop 13 of the table lifter 12, and the side edge of the single plate 2 that slides over the table lifter 11 comes into contact with stop 13 and stops in a laterally tilted state (Fig.

6(A)).

(2) The moving arm 10 on the single plate sliding guide plate 11 is retrieved under the above-mentioned condition (1), and single plate 2 is sequentially piled onto the single plate piling apparatus 12 from the side edge that is in contact with stop 13 (Fig. 6(B)).

(3) When the moving arm 10 is completely retrieved and the single plate 2 is piled onto table lifter 12, the moving arm 10 moves to a position near stop 13 for sliding of single plate table lifter conveyed by the belt conveyer 8 and stands by (Fig. 6(C)).

Furthermore, in the above-mentioned operation, the height of the upper-most member of the single plate 2 piled onto the table lifter 12 is adjusted in the direction of vertical motion of the single plate piling apparatus 12 so that the aforementioned height can be retained at all times for moving arm 10, and detection of the above-mentioned height and timing detection of the retrieval of the moving arm 10 after the single plate 2 comes in contact with stop 13 are performed by the contactless switch such as light intercepting device.

Furthermore, the tilt angle of the single plate sliding guide plate 11, surface material and degree of curve of the curved surface material are appropriately selected according to the thickness and flexibility of the single plate 2.

When the above-mentioned structure is used, the single plate 2 comes in contact with the positioning stop 13 under curved state in the width direction, and weakening of the single plate 2 at the time of contact can be avoided and precision piling can be achieved.

However, in the above-mentioned method, the single plate piling surface is limited to the table lifter provided with a positioning stop, and it is not possible to applied to the case where direct piling on press 3 shown in Fig. 4.

Based on the above-mentioned background, the purpose of the present invention is to provide a single plate piling method in which piling of single plate can be achieved at high precision, and piling can be easily performed for any piling zone, and to produce a single plate piling apparatus with a simple structure capable of achieving the above-mentioned purpose.

[p. 3]

A working example of the present invention is shown in Fig. 7(A) to (E). In other words, in the single plate piling method of the present invention, adsorbing surface material 15 that adsorbs single plate 2 so that it is flat is arranged in the single plate stand by zone next to the single plate piling zone 14 as shown in Fig. 7(A), the single plate 2 conveyed is turned over using the end next to the aforementioned single plate piling zone 14 as rotation around base axis 16 as shown in Fig. 7(B) is achieved, single plate 2 is conveyed to the single plate piling zone 14 as shown in Fig. 7(D), and the above-mentioned process is repeated to successively pile single plates 2 at the single plate piling zone 14.

In this case, the piling position of the single plate 2 onto the aforementioned adsorbing surface material 15 is a position symmetrical with the specific piling position of the single plate piling zone 14 using the aforementioned rotating base axis 16 of the aforementioned adsorbing surface material 15 as the center.

When the above-mentioned structure is used, the single plate piling zone 14 is not limited to a specific area and for example, the structure can be easily applied to the case where an adhesive-coated single plate is piled onto a press in the production of a laminate, as well.

Furthermore, in piling onto the above-mentioned press, the single plate piled with the adhesive-coated surface facing upward upon piling onto the adsorbing surface 15 is turned over and conveyed; thus, it is piled on the press with the adhesive-coated surface facing downward.

Thus, in production of laminate with several processes, the adhesive-coated surface does not come to the upper surface when single plates 2... are piled onto the existing laminate 7 as shown in Fig. 8(A) to (C), and compression can be achieved as shown in Fig. 8(C); thus, it is not necessary to retrieve laminate 7' produced by press 3 as practiced in the past (see Fig. 4(A) to (C) for reference), and falling of a single plate from the adhesive area at the time of retrieval can be prevented. A working example of the single plate piling apparatus used for the above-mentioned method of the present invention is shown in Fig. 9 and Fig. 10. In other words, in the

single plate piling apparatus of the present invention, many vacuum arms 17 having many inlet holes 17a... on the surface are fitted between rotating base axis 16' imbedded in the nest area of the single plate piling zone and a flat surface is formed by the above-mentioned many vacuum arms 17... so that a single plate conveying means 18 is provided, and furthermore, conveyor rollers 19 ... are arranged in the space formed between each of the aforementioned vacuum arms 17 in such a manner that the roll conveyors protrude slightly above the upper surface in the stand by state of the vacuum arm and form a single plate piling means 20, and furthermore, stop 21 is arranged for positioning of the single plate at a predetermined position on the single plate conveying means 18.

Table lifter 22 is provided for the aforementioned single plate piling zone.

Each vacuum arm 17 that structures the aforementioned single plate conveying means 18 is capable of rotating toward the side of the single plate piling zone by means of a motor (not shown in the figure) of rotating base axis 16' as a flat surface is being maintained

Furthermore, vacuum arms 17... are rotated after confirming the conveying of the single plate by a contactless switch (not shown in the figure).

For each space formed between vacuum arms 17..., guide plates 23, which press the single plate 2 against stiffening plates 23' arranged at the side edge and used for positioning, are arranged and moving of the above-mentioned guide plates 23 is achieved by cylinders 24.

Operation of the above-mentioned single plate piling apparatus is described with reference to figure 11(A) to (D).

(1) Press 3' is arranged on table lifter 22 provided at the single plate piling zone. The above-mentioned position is arranged in such a manner that the single plate 2 can be received when the single plate loaded on the single plate conveying means 18 turns over.

(2) The single plate 2 conveyed by the single plate piling means 20 is positioned at the predetermined position of the single plate conveying means 18 as shown in Fig. 11(A) (the guide plate 23 shown in Fig. 10 retrieves to the position that does not inhibit turning over of the single

plate 2), each vacuum arm 17 ... starts intake air movement and adsorbs single plate 2.

(3) As shown in Fig. 11(B), rotating base axis 16' starts to rotate and the single plate conveying means 18 turns over as the single plate 2 is held by suction (Fig. 11(B)).

[p. 4]

(4) When the single plate conveying means 18 turns over and the single plate 2 on the single plate conveying means is conveyed to the press 3', the suction action of the vacuum arm 17... is stopped.

(5) single plate conveying means 18 travels in the reversal direction and returns to the initial horizontal state (Fig. 11(D)). The above-mentioned processes are repeated and piling of single plates 2 on the press 3 is achieved.

In this case, the height of the table lifter 22 is detected by a contactless switch, etc. and an adjustment is made so that the single plates 2 piled and the surface of the upper-most layer of the piled single plates on the table lifter 22 form the contact as the single plate conveying means 18 turns over and forms a horizontal state.

The structure is as described above, thus, the aforementioned single plate piling method can be efficiently achieved and piling of single plate onto the single plate piling zone can be accurately achieved.

In this case, single plate conveying means 18 has a structure comprising vacuum arms 17, thus, single plate 2 is piled flat based on the sucking action as shown in Fig. 12, waviness of single plate 2 observed in conventional piling onto form 1 shown in Fig. 3 is absent, and piling of single plates 2 can be achieved with high precision.

Furthermore, roll conveyer 19 that structures single plate piling means is provided for the space between each of the vacuum arms 17, 17 that comprise the single plate conveying means 18 and single plate conveying means 18 that turns over the single plate 2 and vacuum arms 17 with adsorption function are formed as an integral part of the structure; thus, the overall structure is simple and a smaller installation space is required.

In the conventional method, a piling gap of approximately 50 mm is observed, but when the above-mentioned single plate piling apparatus of the present invention is used, the piling gap can be controlled to ±5 mm.

As described above, the single plate piling method of the present invention consists of the process in which a single plate is conveyed to the predetermined area at the single plate stand-by position next to the single plate piling zone, and the single plate conveying process in which the single plate is turned over as the lower surface of the aforementioned single plate conveyed is sucked and conveyed to the aforementioned single plate piling zone; thus, the piling accuracy of single plate can be improved, and molding process of the laminate can be made easy even when piling is performed for a single plate with an adhesive-coated surface onto a press. Furthermore, the above-mentioned single plate piling apparatus of the present invention has a structure comprising a rotating base axis adjacent to the single plate piling zone and many vacuum arms having suction holes on the upper surface and is provided with single plate conveying means consisting of a single plate piling means that makes turning-over toward the aforementioned single plate piling zone possible, and many conveyor rollers each arranged between the aforementioned vacuum arms and a stop that stops the single plate conveyed to the single plate conveying means, the aforementioned single plate piling method can be continuously and efficiently achieved.

4. Brief description of figures

Fig. 1(A) and (B) show production process of prior art, Fig. 2 shows different production process of the prior art, Fig. 3 shows problem points of prior art, Fig. 4(A) to (D) show problem points upon forming a laminate by the prior art, Fig. 5 is a perspective view of the same, Fig. 6(A) to (C) are operation of the same, Fig. 7 is the schematic view of the single plate piling method of the present invention, Fig. 8(A) to (C) show production process of laminate according to the single plate piling method of the present invention, Fig. 9 and Fig. 10 are perspective views that show working examples of the single plate piling apparatus of the present invention,

Fig. 11(A) to (D) show the operation of the single plate piling apparatus, and Fig. 12 shows the effect of the working example of the present invention.

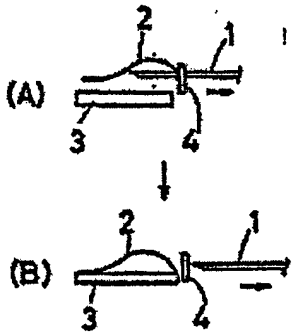
Explanation of codes

14 ... Single plate piling zone, 15 ... Adsorption material, 16, 16' ... Rotating base axis, 17 ... Vacuum arm, 18 ... Single plate conveying means, 19 ... Roll conveyer, 20 ... Single plate piling means, 21 ... Stop, 22 ... Table lifter

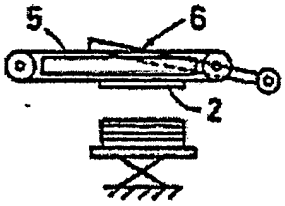
Agent: Akio Miyai, Patent attorney

[p. 5]

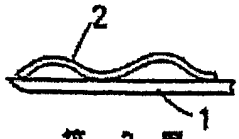
[Fig. 1]



[Fig. 2]

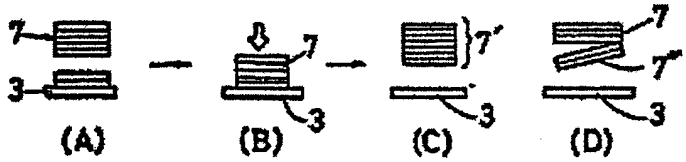


[Fig. 3]

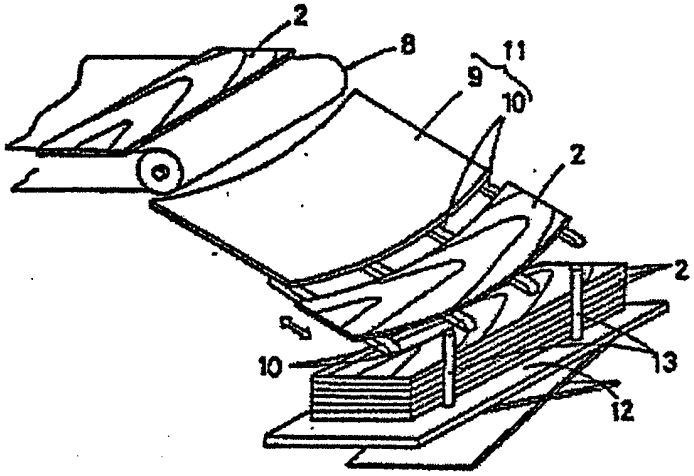


第 3 図

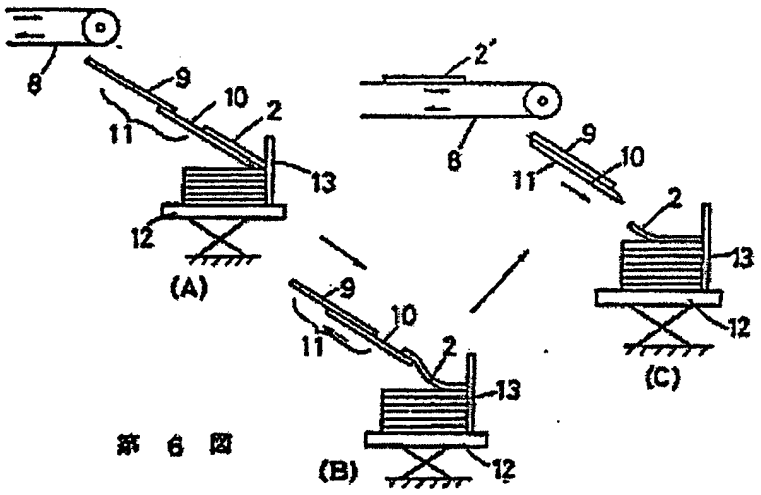
[Fig. 4]



[Fig. 5]

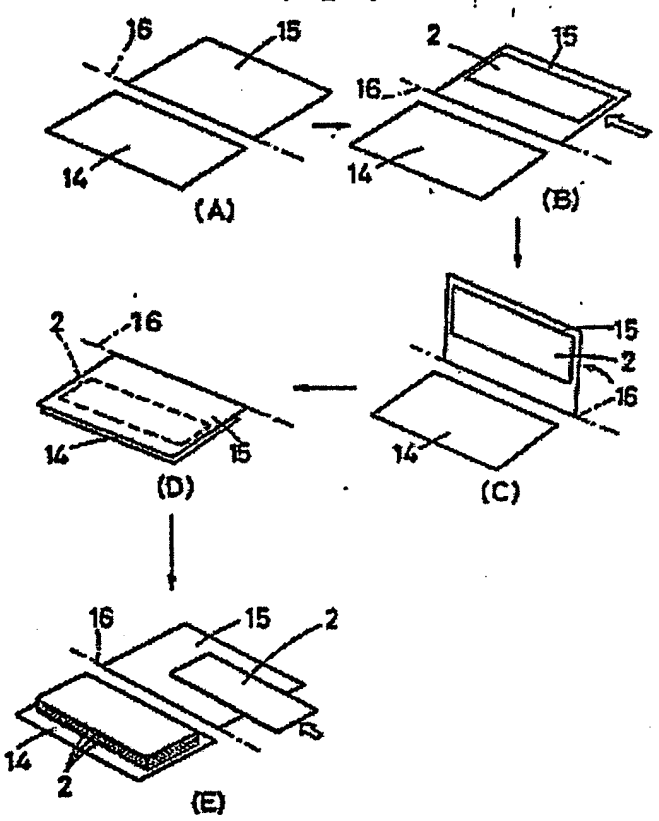


[Fig. 6]

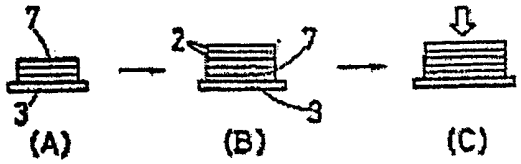


第 6 図

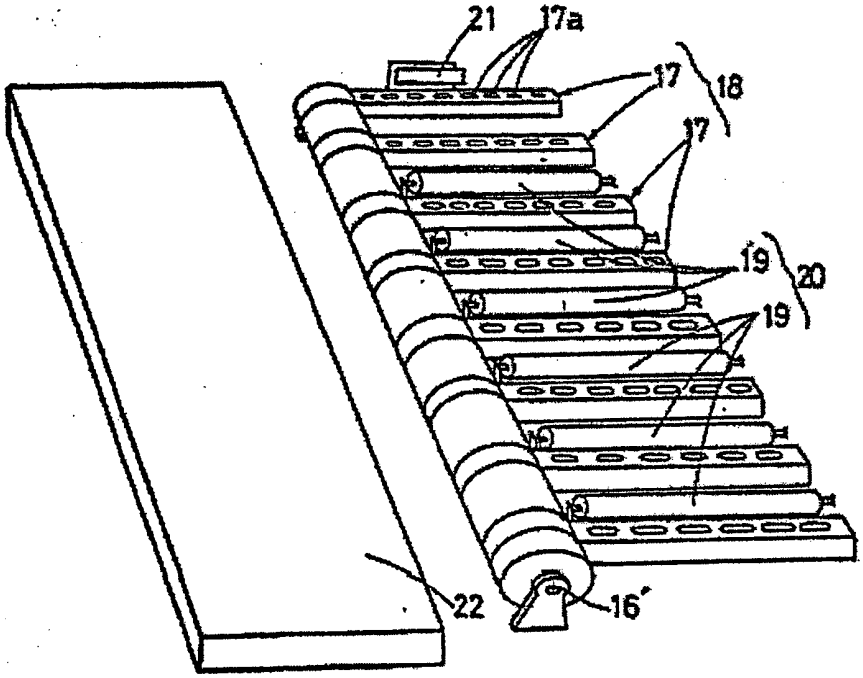
[Fig. 7]



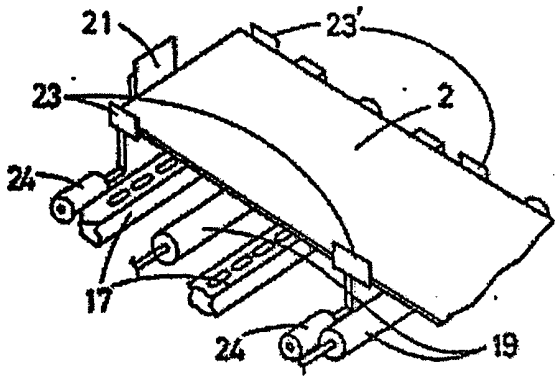
[Fig. 8]



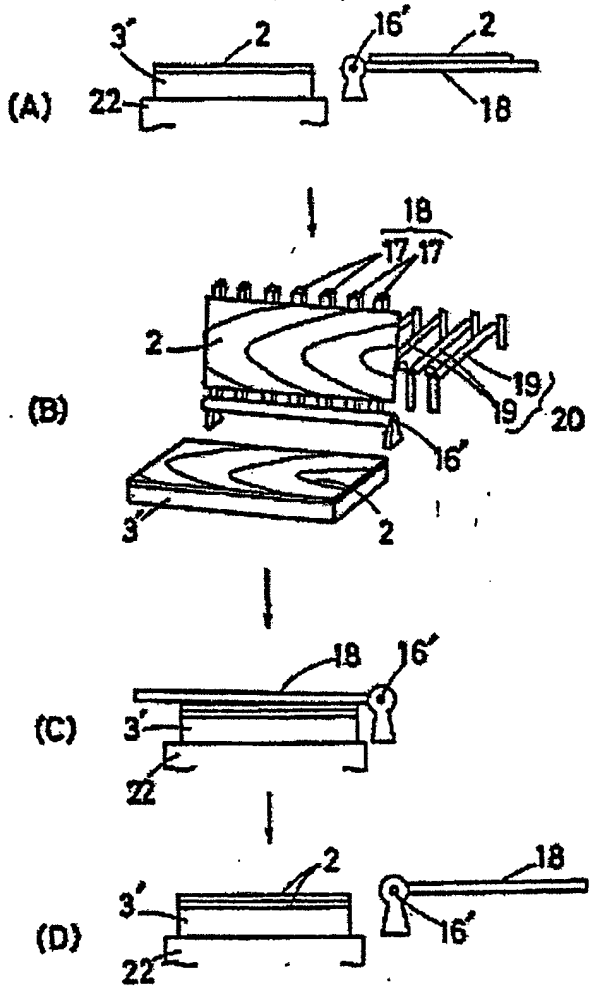
[Fig. 9]



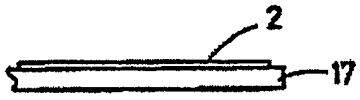
[Fig. 10]



[Fig. 11]



[Fig. 12]



第 12 図